

Winter Weather Precipitation Measurements & CoCoRaHS



So...How Do We Correctly Observe Rain and Snow?



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Observe Rain and Snow?

Rain is easy...

We use a "*Rain Gage*"!



So...How Do We Correctly Observe Rain and Snow?

- During the warm season, liquid is measured from a graduated inner cylinder.
- During the cold season: We remove the funnel and inner cylinder, to collect snow in the outer cylinder (more on that later).



So...How Do We Correctly Observe Rain and Snow?

Winter precipitation is much more complicated and riddled with bad ideas and misconceptions...let's tackle those first!



First...A Few Misconceptions

- 10 to 1 ratio (i.e. 1" of water = 10" of snow)
 - Relatively accurate for many large scale winter events in the midwest, **but MOST** of the Lake Effect Snow events in "The Snow Belt" lack the moisture for such ratios.
 - Anywhere from 20:1 to 40:1 is more likely
 - Precipitation/Snowfall Ratios are temperature dependent. (Colder Temps = Less Liquid)

Here's a couple "real-world" examples, to show you what I'm talking 'bout.....

First...A Few Misconceptions

- 10 to 1 ratio (i.e. 1" of water = 10" of snow)

03/02/1976	12/30/1975	30	21	0.05	0.5	8
03/03/1976	12/31/1975	32	27	0.00	0.0	7
03/04/1976	01/01/1976	32	18	0.00	0.0	7
03/05/1976	01/02/1976	34	14	0.11	2.0	9
03/06/1976	01/03/1976	34	19	0.19	4.5	14
03/07/1976	01/04/1976	22	7	0.03	0.5	14
03/08/1976	01/05/1976	20	8	0.13	2.0	15
03/09/1976	01/06/1976	25	16	0.00	0.0	14
03/10/1976	01/07/1976	25	6	0.42	7.5	19
03/11/1976	01/08/1976	10	-3	0.04	0.5	19
03/12/1976	01/09/1976	15	1	0.04	1.0	20
03/13/1976	01/10/1976	18	8	0.03	0.5	20
03/14/1976	01/11/1976	27	12	0.38	7.0	23
03/15/1976	01/12/1976	27	15	0.03	0.5	22
03/16/1976	01/13/1976	31	2			20
03/17/1976	01/14/1976	29	1			22
03/18/1976	01/15/1976	15				23
03/19/1976	01/16/1976	18	11	0.15	2.5	25
03/20/1976	01/17/1976	13	-10	0.00	0.0	25
03/21/1976	01/18/1976	18	-14	0.00	0.0	25
03/22/1976	01/19/1976	25	10	0.14	1.5	24
03/23/1976	01/20/1976	27	15	0.13	1.5	24

That's more
Like it!!!

Proper Measuring

First, Some Definitions:

Snowfall vs. Snow Depth: The difference and why it's important

- Snowfall- The amount of snow that has fallen since the last measurement. A specific amount over a specific time period (then start again at zero)
- Snow Depth- The **Cumulative Total!!!**
The accumulation of snow, ice, everything on the ground at reporting time, since winter began (think "snow pack")

Winter Storm Watches

Purpose: Winter weather watches provide our customers 12 to 48 hour notice of a hazardous weather event which has the potential to threaten life or property.

Time Frame: They are normally issued for the 2nd and/or 3rd periods of the forecast. Fourth period watches are restricted to the most significant events.

Winter Storm Warnings

Purpose: Winter weather warnings are issued when hazardous winter weather is occurring, imminent or has a high probability of occurring.

Time Frame: They are normally issued for the 1st and 2nd periods. Occasionally, with high confidence for significant events, warnings will extend into the 3rd period.

Measurement Specifics

- Snowfall is measured to the nearest **tenth** of an inch. (e.g.- 2.3")
- Snow **depth** is measured to the nearest **whole inch**. (e.g.- 2")
- Snowfall is what we use to base and verify warnings and advisories on (6.2" in 12 hours)
- You may pick up 4 inches of new snowfall, but it may only add 2 inches to your snow **depth**. *(especially true in our area due to the settling of dry fluffy LES)*
- Point being, they are two separate measurements and are treated as such

Measuring Snowfall

"Perfection" is not possible...

"Representative" is the goal!

Using a ruler or yardstick (graduated in tenths if possible), measure on a snowboard or other hard, flat and level object.

- Grassy surfaces are too variable and inaccurate (big "fluff factor").
- Metal retains heat, especially dark colored.
- Wood (preferably white or light colored) or vinyl/plastic composite works best.
- Ensure proper sighting:
 - Snowboard location should not be in a completely sheltered area, or in a wide open field.
 - A small clearing (such as a backyard) provides a wind break for the snowboard, but open enough to receive representative snowfall.
 - A 45 degree angle view of the sky all around you is ideal.

Measuring Snowfall

- Take several measurements and average to the nearest tenth of an inch.
- The more measurements you take, the more representative your reading will be. It may be necessary to have multiple measuring sites.
- Clear your board off to prepare for the next measurement.
- Reset the snow board level with the top of the existing snow.
 - *If it's too high, new snowfall could blow off...if it's too low, new snow could blow on.*

Measuring Snow Depth

- **Measuring Snow Depth-**

- More straight forward, but still an art.
- Take multiple readings from around your yard and average to the nearest whole inch. The more measurements taken, the more representative the report.
- *Avoid wind blown areas.*
- Take into account any pocket of air created by grassy surfaces, especially early in the season (again, the "fluff factor").
- Take care (late in the season) not to hit a layer of ice and think you hit the ground.

Let's Walk Through the Process

Step 1

Before the onset of colder weather and/or snow, remove the top and inner cylinder of the gage:



Let's Walk Through the Process

Step 2 – Measure the Snowfall

Take 2 (or more) measurements in partially sheltered locations (preferably on snow boards), then *average them* to get your snowfall.



$$\begin{array}{r} 5.7 \\ +6.1 \\ +5.1 \\ \hline 16.9 \\ \div 3 \\ \hline 5.63 \end{array} \rightarrow 5.6 \text{ inches of snowfall.}$$

Remember, snowfall is reported to the nearest *tenth of an inch*.

Let's Walk Through the Process

Step 3 – Measure the Snow Depth

Take 2 (or more) measurements throughout your yard, then *average them* to get the snow depth.



$$\begin{array}{r} 12.9 \\ +11.8 \\ +12.6 \\ \hline 37.3 \\ \div 3 \\ \hline 12.43 \end{array} \rightarrow 12 \text{ inches of snow depth.}$$

Remember, snow depth is reported to the *closest whole inch*.

Let's Walk Through the Process

Step 4

Collect the outer cylinder, then add a measured amount of hot water (using the inner cylinder) to melt the new snow.



Be sure to write down the exact amount of water added!!

Let's Walk Through the Process

Step 5

Once snow in the inner cylinder is completely melted, pour liquid back into the smaller cylinder and take another measurement.



Let's Walk Through the Process

Step 6

Time for some simple math!

Reading of 0.50 inches of water minus
0.22 inches of water added gives a final
reading of 0.28 inches for liquid
equivalent of new fallen snow.



Tube full	0.50
- <i>Water added</i>	0.22

Final reading	0.28

Last Step – Report the Information!

Step 7

OK, you made me do all this hard work - now what do I do with the information?

Let us know!!

3 Easy Ways to Report

- Phone: 1-800-MI-STORM (1-800-647-8676)
- *Real time weather reports anytime (24X7)*
- E-Spotter: <http://espotter.weather.gov>
- *Online real time weather reports anytime (24X7)*
- CoCoRaHS: <http://www.cocorahs.org>
- *Use 800# to phone in significant events outside normal CoCoRaHS report time.*

What is CoCoRaHS?

- Unique, non-profit community-based observing network
- Comprised entirely of volunteers – currently total 14,000+
- Volunteers range in age from 7 years old to 80+

Community Collaborative Rain and Hail (and Snow) Study



Origin of CoCoRaHS

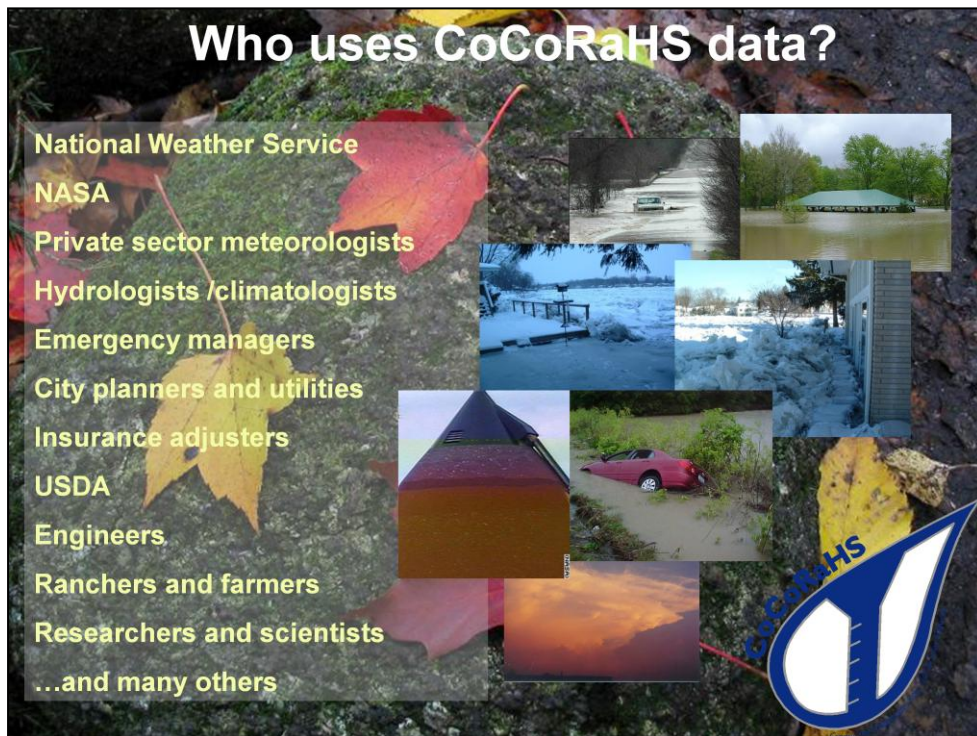
- Developed after deadly Fort Collins, CO flash flood event on July 28, 1997
- Only 1 to 2 inches of rain fell at the “official” observing sites, but 9-12 inches fell in the foothills
- \$200 million in damages and 5 fatalities because “nobody knew it rained up in the mountains”
- CoCoRaHS formed a year later to “fill in the gaps”



Why CoCoRaHS?

- 1) Precipitation is important and highly variable
- 2) Data sources are few and rain gauges are far apart
- 3) Measurements are not always accurate (especially snow)
- 4) Floods and Drought are a part of a "normal" climate cycle
- 5) Storm reports can and do save lives!





The CoCoRaHS data is finding many uses nationally. As more data is collected and more people find out about CoCoRaHS, this list will grow. NASA currently has a network of CoCoRaHS hail pads near the Kennedy Space Center launch pad to document their hail storms. A couple of their pads were dented badly in a late February thunderstorm, which also caused significant hail damage to the space shuttle Atlantis. NASA will be able to study data collected directly from the CoCoRaHS hail pads. Lets look at other possible applications of CoCoRaHS data.

Joining CoCoRaHS

Things we need from you:



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Come Join Us!

- All you need is:
 - *standard 4-inch rain gage (www.cocorahs.org)*
 - *an internet connection*
 - *a maximum of 5 minutes per day*
- Sign up at <http://www.cocorahs.org>.

*Simply by sitting through this presentation (anyone still awake?),
you are fully qualified to join the CoCoRaHS program.*

*We welcome your participation
and look forward to your reports!*

A photograph of a winter forest scene. A paved road curves through a snowy landscape. The trees are covered in snow, and some have orange and yellow autumn leaves still on them. The ground is covered in a layer of snow.

Thanks for attending!

Questions, comments, or concerns?

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